

**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

**[Docket No. NM449; Special Conditions No. 25-420-SC]**

**Special Conditions:** Embraer Model EMB-135BJ (Legacy 650) airplanes, Limit Engine Torque Loads for Sudden Engine Stoppage.

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Embraer Model EMB-135BJ (Legacy 650) airplanes, modified in accordance with design-change application (DCA) 0145-000-00020-2008/FAA (the most current FAA-approved revision; hereafter referred to as “the DCA”). This Model EMB-135BJ airplane, as modified by the DCA, is commonly referred to as the Legacy 650 airplane. It will have a novel or unusual design feature associated with engine size and the potential torque load imposed by sudden engine-stoppage conditions. The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** The effective date of these special conditions is February 17, 2011. We must receive your comments by April 11, 2011.

**ADDRESSES:** You must mail two copies of your comments to: Federal Aviation Administration, Transport Airplane Directorate, Attn: Rules Docket (ANM-113), Docket No. NM449, 1601 Lind Avenue SW., Renton, Washington, 98057-3356. You may deliver two copies to the Transport

Airplane Directorate at the above address. You must mark your comments: Docket No. NM449 You can inspect comments in the Rules Docket weekdays, except Federal holidays, between 7:30 a.m. and 4:00 p.m.

**FOR FURTHER INFORMATION CONTACT:** Carl Niedermeyer, FAA Airframe Branch, ANM-115, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington, 98057-3356; telephone (425) 227-2279; facsimile (425) 227-1149; e-mail [carl.niedermeyer@faa.gov](mailto:carl.niedermeyer@faa.gov).

**SUPPLEMENTARY INFORMATION:**

The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions are impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected aircraft. In addition, the substance of these special conditions has been subject to the public-comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon issuance.

**Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data. We ask that you send us two copies of written comments.

We will file in the docket all comments we receive, as well as a report summarizing each substantive public contact with FAA personnel concerning these special conditions. You can inspect the docket before and after the comment closing date. If you wish to review the docket in person, go

to the address in the ADDRESSES section of this preamble between 7:30 a.m. and 4:00 p.m., Monday through Friday, except Federal holidays.

We will consider all comments we receive on or before the closing date for comments. We will consider comments filed late if it is possible to do so without incurring expense or delay. We may change these special conditions based on the comments we receive.

If you want us to acknowledge receipt of your comments on these special conditions, include with your comments a self-addressed, stamped postcard on which you have written the docket number. We will stamp the date on the postcard and mail it back to you.

## **Background**

On September 19, 2008, Embraer applied for an amendment to U.S. type certificate (TC) T00011AT to include the new certification basis of Model EMB-135BJ (Legacy 650), modified according to major level 1 design change documented in DCA 0145-000-00020-2008/FAA Revision original. This airplane is a derivative of the Model EMB-135BJ (Legacy 600) airplane, which is approved under the same TC.

The Model EMB-135BJ (Legacy 650) airplane, modified according to the DCA, is powered by two Rolls Royce Allison engines, model AE3007A2. The airplane has an interior seating arrangement similar to the baseline configuration Model EMB-135BJ (Legacy 600) airplane, with increased maximum takeoff weight (MTOW) of 24,300 kg. It is intended for long-range operations with enhanced performance, and has additional fuel capacity over the Model EMB-135BJ (Legacy 600) baseline configuration.

## **Type Certification Basis**

Under the provisions of Title 14, Code of Federal Regulations (14 CFR), 21.17, Embraer must show that the Model EMB-135BJ (Legacy 650) airplane meets the applicable provisions of the regulations incorporated by reference in TC T00011AT or the applicable regulations in effect on the date of application for the change to the TC data sheet. The regulations incorporated by reference in the type certificate are commonly referred to as the “original type-certification basis.” The regulations incorporated by reference in TC T00011AT are 14 CFR part 25 effective February 1, 1965, including Amendments 25-1 through 25-85, and 25-86 (applicable for § 25.1517), 25-88, 25-90, 25-91 (applicable for §§ 25.331, 25.335(b)(2), 25.351, 25.363, 25.371, 25.415, 25.491, 25.499 and 25.561), 25-93, 25-94 (applicable for § 25.807), 25-96 (applicable for § 25.571(e)(1)), 25-97, and 25-98, with certain exceptions that are not relevant to this special condition.

In addition, if the regulations incorporated by reference do not provide adequate standards with respect to the change, the applicant must comply with certain regulations in effect on the date of application for the change. The FAA has determined that the Model EMB-135BJ (Legacy 650) airplane must be shown to comply with the airworthiness standards of part 25, including Amendments 25-1 through 25-124, for components, areas, appliances, and systems affected by the type design change presented in the DCA.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Model EMB-135BJ (Legacy 650) airplane because of a novel or unusual design feature, special conditions are prescribed under the provisions of 14 CFR 21.16.

In addition to the applicable airworthiness regulations and special conditions, this Model

EMB-135BJ (Legacy 650) airplane must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34 and the noise certification requirements of 14 CFR part 36.

Special conditions, as defined in 14 CFR 11.19, are issued according to § 11.38 and become part of the type-certification basis according to 14 CFR 21.101(b)(2).

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, the special conditions would also apply to the other model under the provisions of 14 CFR 21.101(a)(1).

### **Novel or Unusual Design Features**

The Model EMB-135BJ (Legacy 650) airplane will incorporate novel or unusual design features involving engine size and the potential torque load imposed by sudden-engine-stoppage conditions.

### **Discussion**

The limit engine-torque load imposed by sudden engine stoppage, due to malfunction or structural failure (such as compressor jamming), has been a specific requirement for transport-category airplanes since 1957. The size, configuration, and failure modes of jet engines have changed considerably from those envisioned when the engine seizure requirement of § 25.361(b) was first adopted. Current engines are much larger and are now designed with large bypass fans capable of producing much larger torque loads if they become jammed. It is evident from service history that the frequency of occurrence of the most severe sudden-engine-stoppage events is rare.

Relative to the engine configurations that existed when the rule was developed in 1957, the

present generation of engines are sufficiently different and novel to justify issuance of special conditions to establish appropriate design standards. The latest generation of jet engines is capable of producing, during failure, transient loads that are significantly higher and more complex than the generation of engines that were present when the existing standard was developed. Therefore, the FAA has determined that special conditions are needed for the Model EMB-135BJ (Legacy 650) airplanes.

To maintain the level of safety intended in § 25.361(b), a more comprehensive criteria is needed for the new generation of high-bypass engines. These special conditions would distinguish between the more-common seizure events and those less-common seizure events resulting from structural failures. For those less-common but severe seizure events, these criteria could allow some deformation in the engine-supporting structure (ultimate load design) in order to absorb the higher energy associated with the high-bypass engines, while at the same time protecting the adjacent primary structure in the wing and fuselage by providing a higher safety factor. The criteria for the more-severe events would no longer be a pure static torque-load condition, but would account for the full spectrum of transient dynamic loads developed from the engine-failure condition.

### **Applicability**

As discussed above, these special conditions are applicable to the Model EMB-135BJ (Legacy 650) airplanes. Should Embraer apply at a later date for a change to the type design of a certified airplane without new model designation on Type Certificate No. T00011AT to incorporate the same novel or unusual design feature, the special conditions would apply to that model as well under the provisions of § 21.101(a)(1).

Certification of the Model EMB-135BJ (Legacy 650) airplane is currently scheduled for

February 18, 2011. The substance of these special conditions has been subject to the notice and public-comment procedure in several prior instances. Therefore, because a delay would significantly affect the applicant's installation of the system and certification of the airplane, these special conditions are effective upon issuance.

## **Conclusion**

This action affects only certain novel or unusual design features on Model EMB-135BJ airplanes. It is not a rule of general applicability and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

Under standard practice, the effective date of final special conditions would be 30 days after the date of publication in the Federal Register; however, as the certification date for the Embraer Model EMB-135BJ (Legacy 650) airplane is imminent, the FAA finds that good cause exists to make these special conditions effective upon issuance.

## **List of Subjects in 14 CFR Part 25**

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

## **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for the Embraer Model EMB-135BJ (Legacy 650) airplanes.

1. For turbine engine installations, the engine mounts, pylons and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
  - a. sudden engine deceleration due to a malfunction, which could result in a temporary loss of power or thrust; and
  - b. the maximum acceleration of the engine.
2. For auxiliary-power-unit installations, the power-unit mounts and adjacent supporting airframe structure must be designed to withstand 1g level flight loads acting simultaneously with the maximum limit torque loads imposed by each of the following:
  - a. sudden auxiliary-power-unit deceleration due to malfunction or structural failure; and
  - b. the maximum acceleration of the power unit.
3. For engine supporting structure, an ultimate loading condition must be considered that combines 1g flight loads with the transient dynamic loads resulting from:
  - a. the loss of any fan, compressor, or turbine blade; and
  - b. separately, where applicable to a specific engine design, any other engine structural failure that results in higher loads.



4. The ultimate loads developed from these conditions are to be multiplied by a factor of 1.0 when applied to engine mounts and pylons and multiplied by a factor of 1.25 when applied to adjacent supporting airframe structure.
5. Any permanent deformation that results from the conditions specified in Special Condition number 3 must not prevent continued safe flight and landing.

Issued in Renton, Washington, on **FEB 17 2011**

A handwritten signature in dark ink, appearing to read 'Ali Bahrami', with a stylized flourish at the end.

Ali Bahrami  
Manager, Transport Airplane Directorate  
Aircraft Certification Service